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## SOME WATER SUPPLY PROBLEMS IN PALESTINE<sup>1</sup>

BY CAPT. H. Y. CARSON

Following the reclamation of the Holy Land by the British troops under the able guidance of General Allenby, one of the first duties of the American Red Cross Engineering and Medical Units sent in February, 1918, from America to Palestine by way of South Africa and India was that of surmounting the troubles occasioned by improper housing and lack of sanitation. The great difficulty of obtaining ample supplies of pure water was perhaps the primary cause for the greatest share of the troubles.

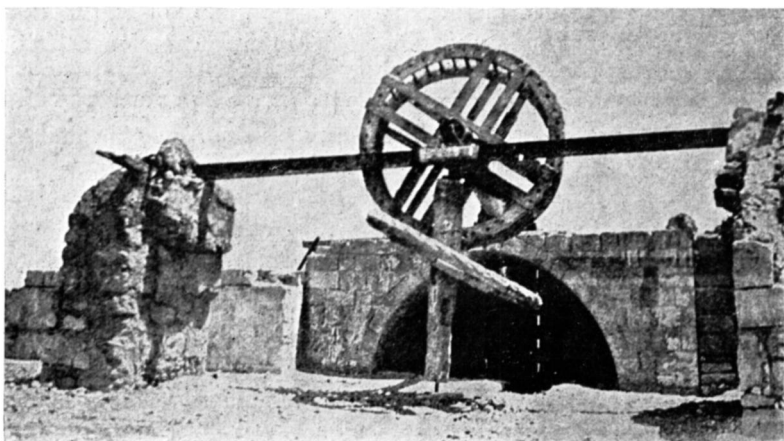
On account of the presence of submarines in the Mediterranean Sea, the American unit, consisting originally of 57 persons under Dr. E. St. John Ward, skilled surgeons, engineers, social workers, nurses and business experts, reached lower Palestine after ninety days of water and land travel around South Africa, India and through Egypt. The ship on which the unit sailed was loaded in New York with 1150 tons of specially selected engineering and medical equipment, which was trans-shipped at two places before reaching Jerusalem; once at Colombo, Ceylon, and again at Port Said, Egypt. The journey from Egypt to Jerusalem was made over the newly constructed military railway which Allenby's able engineers flung across the desert with the fighting army at the rate of  $1\frac{1}{2}$  to 2 miles per day. This railway crosses the Suez Canal at Kantara and traverses the desert which lies south of Palestine.

The first city of importance in Palestine reached by this railway is Gaza, where Allenby fought his hardest battle against the unspeakable Turk and Hun. The line then proceeds northward to the equally ancient city of Ludd and turns eastward through the steep hills with an ever-bending course to the old city of Jerusalem.

Before Allenby undertook to cross the sun-scorched desert into Palestine, he conceived the idea of pumping water from the "Sweet Water Canal" whose source is the Nile, and delivering an adequate

<sup>1</sup>Read before the Buffalo Convention, June 13, 1919.

supply for the five complete army divisions which made up his attacking force. This project called for an immense amount of material and labor in the setting up of complete pumping and filter plants having a capacity variously estimated at 5,000,000 to 10,000,000 gallons daily. The 12-inch force main which crosses the Suez (likewise near Kantara) parallels for the greater part of its course the military railway mentioned above. The pumping plant at Kantara delivered the water into a 12-inch force main which terminated about 50 miles beyond the desert in a reservoir. There the water was pumped through a 10-inch main about 40 miles, and was then



THE WELL OF ABRAHAM AT BEERSHEBA

This deep well, like many others in Palestine, yields water of excellent quality, in spite of the great age of the well.

pumped a third time through an 8-inch main 50 miles long, to Gaza. These pipes had been intended for oil transit lines, but were never used for that purpose. They were laid on the surface of the ground and then covered with about  $1\frac{1}{2}$  feet of sand or soil to protect them from the direct rays of the sun.

In spite of the fact that the water was forced through the many miles of pipe at a rate sufficient to give every man in the army an allotment of 3 to 4 gallons per day, and animals from 5 to 10 gallons per day, the problems of conveying the water on the backs of pack animals or by "lorry", often under shell fire, to the ever advancing

front line proved extremely difficult at times. During several hard days of fighting near Gaza the British soldiers in many instances succeeded in maintaining their life on an allotment of  $1\frac{1}{2}$  pints per capita per day. Of course, this water was used for making tea.

These waters of the Nile served only the lower portion of Palestine. The supplies for such cities as Jerusalem, Gaza, Beersheba,



THE DOME OF THE ROCK MOSQUE

Here, in the heart of Old Jerusalem, Solomon built the Temple, and water from the Living Springs 16 miles distant emerged from fountains.

Hebron, Eskalon, Jaffa, Jericho, Nazareth, etc., are obtained from local sources, springs, wells, etc., some of which yield an abundance of pure water, others a scanty supply. Under the surface can be located plenty of water in all the regions of the territory which lie within the ancient boundaries of Palestine, that is from Beersheba to Dan, and from the Mediterranean Sea to the Jordan River.

The climate of Palestine is subtropical, being somewhat similar to some of our own semi-arid states in the Southwest. It seldom rains during seven out of twelve months of the year, and although the rainfall at Jerusalem is said to equal about 30 inches per annum, the geological structure of the country accounts for the fact that very little water is retained on the surface of the ground. The surfaces are stony



WATER PEDDLER CARRYING WATER IN A LEATHER BAG THROUGH A STREET IN  
JERUSALEM

and consist for the most part of porous limestone which permits the water to disappear quickly. However, the water-table is fairly close to the surface, as evidenced by the excellent shallow wells and springs that are found in the dried up "wadys" amongst the barren hills.

Notwithstanding the fact that Palestine is hardly larger than one of our smallest states, New Hampshire, its climate is quite variable.

On the western slope near the sea the Plains of Sharon are quite suited for the production of semi-tropical fruit trees, such as oranges, dates, etc., while at Jerusalem, which is about 2400 feet above the sea level, the climate changes quite perceptibly. To the east of Mount Moriah and the Mount of Olives lies the great Jordan River valley, in reality a huge geological "fault" with the Dead Sea lying 1300 feet below sea level. Viewed from the Mount of Olives on a clear day the Jordan River stretches out before an observer's eyes like a large mirrored ribbon coming down from the snow peaks of Mount Hermon to the north, and joining the placid Dead Sea glistening in the resplendent sun that pours over the blue hills of Moab lying on the east side of the river.

The springs 16 miles south of Jerusalem, which are probably the same ones given by Caleb<sup>2</sup> to his daughter, are used as the best modern source of water supply for Jerusalem. The British engineers installed a 300,000-gallon per day pump operated by two 66 h. p. Hornby gasoline engines at the springs and laid a 6-inch force main to the city in about 70 working days. At Jerusalem the water is distributed from a reservoir on top of a hill.

The pools of Solomon located about 3 or 4 miles closer to Jerusalem are large impounding reservoirs capable of holding 80,000,000 gallons. Other springs surrounding Jerusalem can, without serious difficulty, be developed to supply by modern methods quite an abundant and wholesome supply of water in a quantity undreamed of by the ancients.

Each house in Jerusalem has a cistern, which was formerly used for storing rain water. The British sanitary department compelled the householders to clean them thoroughly, and they were then filled with wholesome water by means of temporary pipes. The vendor of water from a skin bag slung over his shoulder and the water fantazies on donkeys and camels must give way to the less picturesque but more practical and sanitary methods of distribution.

To the engineer who has been privileged to work with the valiant British in the reclamation of the Holy Land, there comes with emphatic force the thought that America, with its abundance of resources and the capacity of its manhood to develop those abundant resources, is truly blessed among the modern nations of the earth.

<sup>2</sup> Joshua, 15:19.